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ABSTRACT

This paper reports on a study of what it means to create authentic learning experiences for teachers and students in a southern urban elementary school context. A teacher education model emphasizing local environmental, cultural and historical themes, structured inquiry-based learning, and student-directed assessment strategies was implemented. We implemented this model through our work with pre-service elementary school teachers at a southern, urban university, and with in-service teachers and grade school students in the lowest performing elementary school in the state of Louisiana (as determined by a newly-developed statewide academic accountability measure). The study highlights tensions between teaching that aims to promote personally meaningful connections to science and social studies, and teaching that aims to promote the acquisition of Western canonical knowledge (as represented in state content standards and assessed through high-stakes accountability plans). By reporting on the kinds of approaches and activities that each of four groups of participants (teacher educator/researchers, pre-service teachers, in-service teachers, and grade school students) found to be personally meaningful and how these approaches and activities varied from group to group, insight was provided into one reason why broad-based science and social studies literacy, as advocated in the national reform documents, remains elusive. (Contains 16 references and 1 figure.) (Author/MM)

Running head: Authentic Environmental Inquiry Model

Authentic Environmental Inquiry Model: An approach to integrating science and social studies in under-resourced urban elementary schools in Southeastern Louisiana

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Abstract

This paper reports on our study of what it means to create authentic learning experiences for teachers and students in a southern urban elementary school context. We developed a teacher education model emphasizing local environmental, cultural and historical themes, structured inquiry-based learning, and student-directed assessment strategies. We implemented this model through our work with pre-service elementary school teachers at a southern, urban university, and with in-service teachers and grade school students in the lowest performing elementary school in the state of Louisiana (as determined by a newly developed state-wide academic accountability measure). Our study highlights tensions between teaching that aims to promote personally meaningful connections to science and social studies, and teaching that aims to promote the acquisition of Western canonical knowledge (as represented in state content standards and assessed through high-stakes accountability plans). By reporting on the kinds of approaches and activities that each of four groups of participants (teacher educator/researchers, pre-service teachers, in-service teachers and grade school students) found to be personally meaningful and how these approaches and activities varied from group to group, we provide insight into one reason why broad-based science and social studies literacy, as advocated in the national reform documents, remains elusive.

Research Problem

Faculty at the University of New Orleans have spent the past year redesigning the science content, science methods and social studies methods courses taken by our pre-service and in-service elementary teachers to highlight the unique teaching and learning context of the New Orleans metropolitan area. The focus of the redesign has been to emphasize local environmental, cultural and historical themes, inquiry-based learning, student-directed assessment strategies and the integrated use of emergent educational technology. Through this process we have developed the Authentic Environmental Inquiry (AEI) Model (see figure 1) as a way to frame our thinking about how we prepare our pre-service teachers to work with K-8 students in urban settings and how we model this framework for them in our own teaching of their university methods courses. Teachers in our courses are responsible for planning and developing thematic multimedia units on environmental topics relevant to the context of Southeastern Louisiana. They then pilot test elements of these units during a co-requisite practicum placement in an urban elementary school.

This paper reports on our study of the implementation of the AEI model within the context of the lowest ranking elementary school in the state of Louisiana (as determined by a newly developed state-wide academic accountability measure). We developed a collaborative program with this school whereby a group of fourteen teachers agreed to go through our Masters degree program in curriculum and instruction as a cohort, with coursework being offered at their school site. Once this relationship was established, we also began placing practicum students in this setting. Having our pre-service teachers practice applying the AEI model with students in this setting provided them with a valuable experience in a challenging but well-supported teaching environment, while also benefiting the grade school students and providing opportunities to discuss meaningful instructional practices with the school's in-service teachers.

At the same time, we, as educators in Louisiana, have been concerned with the implications of the Louisiana Educational Assessment Program for the 21st Century (LEAP21), the new statewide, high stakes assessment with consequences of grade retention in the 4th and 8th grades for students who fail to meet the minimum standards. These exams (taken in English, mathematics, science and socials studies) emphasize inquiry processes, analysis and interpretation of data and a variety of written and performance tasks. To succeed on these assessments, students must learn to do science and social studies, not just learn a collection of facts about these subjects. However, because most of the teachers we work with have never had these kinds of learning experiences themselves, we found that it is nearly impossible for them to facilitate these experiences for their own students. Compounding this problem was the fact that many of these teachers had developed the misguided belief that because the LEAP21 is a "standardized test," it was necessary to teach students using a "back to the basics" approach to prepare them to succeed on the test.

With these issues in mind, we set out to develop a model that would guide teachers through inquiry experiences as active participants in authentic problem-posing and

problem-solving, while also preparing them to facilitate this kind of inquiry with their own students. By focusing on local environmental and community issues, the resulting AEI model uses curriculum, instruction, and assessment approaches that promote inquiry within the context of students' (and teachers') lived experience.

As we began to implement our model as teacher educators, we felt that, as researchers, it was also important to explore the following research problem: How could we enact a model of authentic environmental inquiry within and against a culture of high stakes assessment? That is, within a school culture that had become singularly focused on preparing students to succeed on a high-stakes, standardized test, how could we convince teachers that using our model would effectively prepare their students to succeed on the LEAP21 exam while also providing them with other academic benefits (i.e. making science and social studies personally meaningful). Or put another way, could we help these teachers meet their academic agenda while also helping them change their practices to be more aligned with our political agenda of using science and social studies to promote social action? This research problem led us to the following research questions:

1) How do students and teachers in various social spaces take up, transform and apply the model of curriculum that is presented in the AEI model?
2) How do students and teachers in various social spaces take up, transform and apply the model of instruction that is presented in the AEI model?
3) How do students and teachers in various social spaces take up, transform and apply the model of assessment that is presented in the AEI model?
4) How do the perceptions and realities of high-stakes standardized testing play out in the various social spaces of this study?

Conceptual Framework

The conceptual framework that underlies our research is grounded in the notion that effective education is predicated on understanding the social and cultural contexts created and inherited by our students within both the school setting and the broader community. One way to understand these connections is to consider the idea of educational authenticity. We frame this issue in terms of a tension between *de facto* authenticity based on what is meaningful within the Western canon and contextual authenticity based on what emerges as meaningful to the participants in a given learning community. In the following section we rely primarily on the science education literature because this is the context within which we have been following this debate on educational authenticity. In our own findings from this research, however, we will discuss these ideas in the contexts of both science and social studies.

The focus on promoting "science for all" that has been at the heart of the national science education reform movement has led to discourse on creating "authentic" science learning opportunities for students. But who gets to define what is authentic? It is clear that we do not all share a common vision of authenticity. Petraglia (1998) has described learning environments as authentic when there is a similarity between the structured (academic)

learning activities and some meaningful (non-academic) context for that activity. In other words, activities are intended to simulate the everyday practices of scientists in the classroom, what Petraglia refers to as "practice fields." This perspective is supported by the National Science Education Standards (NRC, 1996), which advocate the creation of classroom science learning activities that are open-ended and inquiry-based as a way to engage students in tasks that are better aligned with how science is actually done outside of school. As Hay and Barab (1998) point out, however, in developing authentic learning environments, one must consider the question of what is authentic for whom? That is, what is authentic for the teacher may not be authentic for the student and what is authentic for the student may not be authentic for the teacher. As their own approach to dealing with this dilemma, Barab and Hay (2001) promote giving students opportunities to work at the "elbows of experts" through engagement and participation in on-going research endeavors with science practitioners. While we certainly agree that such an approach to teaching is likely to be more authentic than most classroom activities, this is still an example of a static *de facto* vision of authenticity being imposed on students by their teachers.

The alternative to this *de facto* view of authenticity is the creation of a contextually authentic curriculum. Heath & McLaughlin (1994) have argued that students, as learning participants, construct meanings of school content that are shaped by both the content to which they have access and their reasons for learning this content. In other words, students have their own purposes for choosing to engage or not engage in learning whether we, as educators, recognize and acknowledge these purposes or not. This notion forces us to redefine our ideas in terms of emergent authenticity based on personally meaningful learning, an authenticity that evolves gradually as individuals and groups participate in tasks that have some intrinsic value, both individually and collectively. Angie Barton has provided an example of what this approach might look like in practice when she describes her ideas about "youth science" (Barton, 1998), a science education that is: 1) critical, transformative and relevant; 2) focused on social justice; & 3) meant to redefine traditional classroom relationships. Her work with children in homeless shelters points to the importance of teaching that begins with an acknowledgement of the students' life circumstances outside of school and a focus on topics of interest and of use to the students. Jim Gallagher's work to create "intergenerational, community-based learning" (Gallagher & Hogan, 2000) is another example – one that is particularly relevant to the present study. In Gallagher's work to engage students in Vietnam in a program to reduce rural deforestation, he found that school children were more effective than government agencies or international aid workers in getting village elders to consider making changes in community agricultural practices that led to deforestation. The school children, as members of the community became interested in making a difference at the same time that they were learning valuable lessons and skills in both science and social studies.

Another quality of the previous work that has been done with contextually authentic curriculum, is that most of it has been done outside of traditional classroom settings. Eisenhart (2001), in her work with middle school girls in an urban community center, attempted to base her curriculum on science topics that were student-generated and

connected to the community. The challenge she faced was that the topics that were of greatest interest to the girls in the program, such as music and fashion, were not readily connected to useful science topics. Nancy Brickhouse (2000) faced a similar challenge when she tried to use a contextually authentic curriculum as the basis for teaching an alternative science class in an urban high school. After feeling unsuccessful in this endeavor, Brickhouse then used virtually the same approach (successfully, this time) in an after school science club setting. She concluded that out-of-school science experiences are often more meaningful to students because they are driven by more practical needs and are not constrained by the artificial conditions of school science (i.e. grades, exams, mandatory participation).

These studies we have described led us to pose the following reflexive questions: What can we do as educators committed to contextually authentic curriculum when what the teacher (or the state standards, etc.) considers to be authentic (valuable) is not seen as meaningful to the students and what is meaningful to the students is not seen as valuable (authentic) to the teacher (or the system)? In our attempts to teach both science and social studies by inquiring into the local environment, we have created and modeled the teaching of inquiry activities that we found personally meaningful, while also attending to what the state has decided is valuable for elementary grade students to learn about science and social studies. We held the expectation that the pre-service and in-service teachers with whom we were working would likewise develop their own activities that they found both personally meaningful and authentic. These teachers pilot tested the activities they developed with urban elementary grade students and both they and we attempted to discover whether the students in these classrooms perceived these activities as personally meaningful.

In our attempt to make sense of what was seen as authentic by the various participants in our study, we also relied on anthropological theories of practice that highlighted the active role that individuals play in creating (not just being part of) the cultural groups in which they are members (see Eisenhart, 1998 for a good historical overview of practice theory, and Levinson, Foley & Holland, 1996 for numerous examples of how these perspectives can be used to make sense of interactions in educational settings). Our understanding of how individuals both shape and are shaped by the various social and cultural contexts in which they move is fundamental to how we both conceptualized and carried out the present study. Our (predominantly White, female, suburban, middle-income) pre-service teachers, our (predominantly African-American, female, urban, middle-income) in-service teachers, and our (predominantly African-American, urban, low-income) grade school students came to us (White, middle-income teacher educators) with various ideas about what was meaningful and important to them as individuals. At the same time, within the educational settings in which we all interacted, each group of individuals (ourselves included) negotiated collective ideas as to what we found meaningful and how this connected (or failed to connect) to what the broader educational power structure defined as authentic. Our theoretical commitments, therefore, forced us to abandon *de facto* definitions of authentic science and social studies learning environments and activities in favor of a desire to explore how these environments and activities emerged through our interactions over time. In the end, the meanings and

practices of environment and community that we describe were jointly constructed and negotiated by all participants within a particular set of communities of practice.

Methods

Our theoretical perspectives and research questions grounded in attempts to understand teaching and learning as it is negotiated within social and cultural contexts led us to adopt interpretive methods of data collection and analysis that were likewise grounded in understanding culture in context. Graduate students and the teacher educators as researchers collected a wide range of data streams over the course of one full year (spring, summer and fall academic semesters). Data were analyzed (again by both graduate students and the researchers) in an ongoing and recursive manner, in an attempt to elicit cultural domains for analysis and interpretation.

Data Sources

Five primary data streams were collected and then fed into the semantic structure analysis described in the following section. Data collection focused on the actions and interactions of four groups of participants: a) the urban grade school students in the classrooms in which we worked; b) the in-service teachers who were the regular teachers of these students; c) the pre-service teachers in our methods classes who did their practicum experience in these classrooms; and d) ourselves, the teacher educators, as instructors of the methods courses. Specific kinds of data we collected were:

1) Ethnographic field notes taken by graduate students and by the instructors for each class session in the university setting and for each day of field placement in the elementary school. These field notes were both a record of what transpired and researcher "on-the-spot" reflections and interpretations of those events.
2) Assignments and products from both the teachers (integrated environmental unit plans, digital video movies) and the elementary students in the practicum site (oral histories, digital video movies and written assignments) were collected, reviewed and analyzed.
3) Photo and video recording of selected class activities in both the university setting (peer teaching, presentations of completed units) and the practicum setting (outdoor environmental studies, student presentations) provided visual representations that augmented, supported and redirected the written field notes.
4) Pre-service teachers' practicum experience journals and surveys in which they described positive and negative aspects of the practicum experience in general and their attempts to implement the AEI model in particular provided focused participant reflections directly related to our research questions.
5) Researcher reflective journals provided us with a record of the evolution of our thinking about the meanings of science and social studies that we were creating for ourselves and experiencing in our interactions with the other study participants.

Data Analysis

Data were first coded into cultural domains using both the sociolinguistic categories proposed by Spradley (1980) and the conceptual categories that emerged as we constructed and refined the AEI model. Domains were also elicited from participants using free lists modeled after Borgatti (1999). These domains were then arranged into a taxonomy that served to inform future data collection, additional domain coding, and revisions to the AEI model. This taxonomic analysis resulted in the current formulation of the AEI model as seen in figure 1. Third, the domains were organized into tables along dimensions of contrast (after Spradley's componential analysis) and each of the data sets were revisited to identify examples of the contrasts across the domains. Finally, these tables were used to generate assertions from the data that could be related to the research questions and then supported with specific examples.

Semantic structure analysis provided a systematic and rigorous approach to analyzing the various data streams with the goal of illuminating cultural behaviors, cultural knowledge and cultural artifacts. The primary goal of this analysis was to examine how participants viewed and made sense of their own interactions. In contrast, vignette analysis provided an opportunity both to be more creative in our analysis and to explore and express the understanding that we had of the cultural scenes being studied. As Graue (1998) has stated,

> Writing is an interpretive activity that shapes how we know as readers as well as how we know as researchers. Just as the role we enact as researchers provides us with very situated perspectives on the topic of interest, the role we take as writers allows only certain things to be explored, by us or our readers. The boundaries of writing have broadened considerably in recent years, making choice of writing style a methodological, theoretical and even political decision. (p.186)

Thus, vignette analysis allowed us to capture a more holistic picture of the data. In the following findings section, data from both types of analysis are presented to explore the voices of all the groups of participants in the research.

Findings

Our approach to preparing pre-service elementary teachers has been grounded in our development of the AEI Model. This model has emerged from our theoretical and practical commitments to what we believe teachers must do to facilitate the creation of authentic learning opportunities with their students. The model is also meant as a guide for teachers looking for a way to prepare students to succeed on Louisiana's new high stakes assessments. We organized and taught this model around particular views of curriculum, instruction and assessment. Our approach to curriculum was based on the need to make the content of both science and social studies learning hands-on, minds-on and lives-on. Our approach to instruction focused on the need to engage learners in structured inquiry. Finally, our approach to classroom assessment emphasized our desire to see students of all ages assuming greater control over how to document their own

learning. Each of these commitments can be tied back to the tensions we feel as teacher educators between canonical and emergent authenticity and between personally meaningful learning and high-stakes assessment. We believed that our approaches would promote science and social studies learning that was personally meaningful while also readily connecting to the canonical knowledge for which students would be held accountable.

For each of the three primary components of our model (curriculum, instruction and assessment), we identified various actions that we believed to be indicators that these components were being enacted in ways that were consistent with our commitments. In the following sections we have selected one of these indicators for each of the three major components. For each indicator we present examples from our data of how each of the four groups of participants (teacher educators, pre-service teachers, in-service teachers and grade school students) took up, transformed and applied these approaches to environmental inquiry (or didn't) in ways that made it personally meaningful to them (or not).

Note that in the fieldnote excerpts and vignettes that we present, we sometimes use the pronoun, "I," and at other times "we." In the case of vignettes and fieldnotes related to science, "I" refers to Buxton, while in the case of vignettes related to social studies, "I" refers to Whatley.

Curriculum in support of Authentic Environmental Inquiry

Although we used several approaches to developing a hands-on, minds-on, lives-on curriculum, we wish to focus here on our attempts to connect the topics being taught to the participants' personal lived experiences, their families and their communities. We hoped that this focus would be a natural link for students as we searched for ways to connect the personally meaningful with the externally mandated.

Connections to lived experience, family and community

teacher educators

New Orleans is a city with a unique geography that is closely tied to its rich cultural and political history. Everyone who lives in the city routinely passes landmarks that are a part of that history. Part of what we believed could make learning about science and social studies both meaningful and authentic for our participants was to address these unique features while connecting them to the benchmarks that our students needed to master. The following fieldnote excerpt shows how I attempted to make this connection through the context of a historically significant site that was of personal interest to me.

> We are meeting outdoors at the end of Bayou St. John.
> CB talks about the proximity of this location to Benjamin Banneker and the possibility of bringing the kids here on a walking filed trip. Anne

smiled and spoke quietly to the rest of her group. They seemed excited about this prospect.
CB: So what do you know about Bayou St. John? Why is it important or significant to the history of New Orleans?
Jane: It's how the early French settlers brought things from the lake to the river. (She points in the direction of Lake Pontchartrain.)
Martha: It was the site of voodoo rituals and the buying and selling of goods. There was an Indian market right here at the top of the bayou.
CB: Really? I've never heard that before.
Martha: I learned about it in a history class.
Lynne: It was also important in the War of 1812. There was a fort where the bayou meets the lake and some British ships tried to sail up the bayou to get closer to the city, but they couldn't get past the fort.
CB: Right, Fort St. John. Wow! I'm impressed. You all are the first group I've had out here that has a good sense of the history. So why was it so important to have a bayou if it only went half way across the city?
Sara: Because it was a lot easier to float supplies and merchandise on a boat than it was to carry it on a horse and wagon. And because Bayou St. John was natural instead of man-made the Native Americans had been doing this for a long time already by the time Bienville and Iberville showed up. It was the closest connection between the Mississippi River and Lake Pontchartrain.
CB: Ok, great. So those were its historical uses. How about today? What is it used for today?
Anne: Canoeing
Brianna: Fishing
Sara: People like to walk or jog or walk their dogs along the sides.
Lynne: Teenagers hang out and drink beer.
CB: Great! So to use it for all those purposes, the bayou needs to be kept pretty clean. So we're going to do some activities today to examine how clean, or not, the area is. (fieldnotes 10/4/01)

In the social studies course, our commitment was to help teachers recognize that all students come to school with both individual and family experiences that can help enhance their understanding of and motivation for learning social studies content. Beginning the first week of class, students reflect upon their own experiences with social studies and how these will influence their future teaching and learning by writing and sharing social studies autobiographies. After reading a number of children's books that portray varying family structures from diverse cultures, students collect their own family stories through oral history interviews and present these to the class through a computer-based slide show. Next, students investigate community history and resources through reading, Internet resources, and field trips to sites such as the historic French Quarter and our local cemeteries with their unique above-ground tombs. These are the kinds of experiences that make social studies meaningful to us, and thus, this is how we present social studies to our students.

pre-service teachers

One of the fundamental goals of the elementary science methods courses is to get the pre-service teachers, many of whom have had largely negative prior experiences as science students to rethink their ideas about the nature of science and along with that, their ability to be successful teachers of science to young children. The starting point for this process is to get students to examine their past experiences with science and their beliefs about scientists and their work. The "draw a scientist" activity always leads to important discussions about where people get their ideas about scientists.

> CB asked the students to close their eyes and imagine a scientist – what that scientist looked like and what that scientist was doing. Students were then asked to open their eyes and draw the scientist they had imagined.
> At first there was some light discussion among students, but then they got quiet and everyone seemed involved in the project. When they finished, CB told the students to display their scientists around the classroom.
> CB: We are going to create a little scientist museum. After everyone has put up their picture, I'd like you to get up and circulate around the room to look at all of the drawings. Look for things you see in common and things that are different.
> While the students are looking at the pictures, CB has put on a torn and dirty lab coat, gotten a large beaker of green liquid, and put a pair of goggles on top of his head.
> Students smile when they see this.
> CB: So what similarities or common themes do you see in the drawings?
> S: A lot of lab coats.
> S2: Crazy hair.
> S3: Glasses.
> S4: They're mostly men.
> CB: And what are they doing?
> S2: They're in labs.
> S5: Most of them are doing stuff with chemicals.
> CB: So are there any differences?
> S6: There's that one of a woman in the forest.
> S1: And that one where the scientist is scuba diving under water.
> CB: Ok, good. So there are a few that are different but a lot of them share those characteristics that we listed first: white men in lab coats with crazy hair doing chemistry in a lab. So obviously, this is a stereotype that we have. Is this a problem that we have this stereotype?
> Jane: Yes, definitely, because if you're not a white male, you might not identify yourself in the role of a scientist.
> CB: Ok.
> Kristen: And if you don't want to work in a lab you might think that you can't be a scientist.
> CB: Good, so I hear you saying that this stereotype is a problem because it paints a narrow picture of who does science and of what science is and this limits who might think they want to be a scientist.

> Sara: I drew the picture of the woman in the forest because I'm a plant person and I know that what you have to know to take care of plants is science, so really, I consider everyone a scientist. We all do things that involve science whether we're aware of it or not.
> CB: Absolutely. In fact, that's going to be a theme throughout this course. There's some science that only practicing scientists need to know, but there is other science that everyone should know, and we're going to call that science literacy – the science we want everyone to know.
> CB goes on to ask about where this stereotype of a scientist comes from (responses include TV, movies, science teachers, science textbooks) He then asks the class about their own experiences with science in school. Three students said they had mostly positive experiences, but a majority of the class raised their hands when he asked if they only remembered a few positive experiences with school science. Two raised their hands for no positive experiences.
> Joy: But if scientists have this "wacky" image people don't want that image.
> Ronda: Especially kids. They're trying so hard to be cool for their friends that they aren't going to want the image associated with being good in science. (fieldnotes 8/30/01)

As the "draw a scientist" activity caused pre-service teachers to think about their place in relation to science, the oral history interviews with family members caused these teachers to think about how they are connected with social studies. Many students consider this activity to be their most significant learning experience of the social studies course. Topics for the interviews are wide-ranging, but students frequently choose to interview grandparents and older relatives who have lived through significant historical events such as the Depression, World War II, or the Vietnam conflict. Others focus on more local experiences such as surviving hurricanes, floods, fires, or being victims of crimes. Several students have interviewed family members who live in other countries or who have immigrated to the United States. The personal as well as academic connections of this project are evident in comments like the following:

> I absolutely enjoyed the oral history project. It gave me a reason to find out about my grandmother [who came to New Orleans as a refugee from Honduras]. Sometimes you take people for granted. You assume that they are always going to be there. I learned a lot about my grandmother. I didn't know that she was a teacher before she got married and had nine children. And, I learned a little about history and about the dictator that Honduras had for many years. (CC final reflection; 5/10/01)

Another pre-service teacher wrote:

> I found the oral history presentations to be as much of a community-building activity as the classroom rituals. The project was extremely valuable to me because I was able to consider the practical application of

> these histories in my future classroom, and I like the idea of being able to have my students learn and share themselves at the same time. (anonymous final reflection; 5/10/01)

Just as the oral histories connected our pre-service teachers with their communities in the past, the field trips we took connected them to their communities in the present. Most teachers responded enthusiastically to taking field trips and engaging in community-based research themselves. On their final course evaluations, students cited the field trips, especially the cemetery field trip, as their most fun learning experience of the course. One student wrote:

> I enjoyed being a tourist in my hometown, and I especially enjoyed the cemetery trip. It was informative to learn about these places. More importantly, it made me consider where I can take my classes once I start teaching. We are in the midst of a rich, historically and artistically diverse city but, by living here, we tend to forget what is special about it. (anonymous final evaluation; 5/10/01)

in-service teachers

Cory: Having come to Louisiana after teaching in Colorado where there was a strong outdoors culture, one of the biggest transitions of teaching in New Orleans has been working with people who generally like to stay inside. In my work with teachers I have been using nature journals as a way to get teachers to observe nature and how it changes overtime. I was surprised to find that many teachers described observations they made in their own yards and how they noticed things that they had never noticed before.

> It has become breezy and cool this week. My son, Allen, and his friends are blowing bubbles – big bubbles, small bubbles and I'm looking up in the old tree in the back of the yard. I notice that the tree still has those spider webs in it, way up high. I remember a couple of years a go when we had that huge outbreak of that tree disease when the trees were all covered with webs. It's funny that you still see certain problems that were supposed to be taken care of when you look closely. I never noticed that they were still up there. (BP journal; 9/22/01)

> Yesterday my husband cut the grass. I wonder if different insects live in short grass than in longer grass? Something else has become obvious to me also. I have a flowerbed in my front yard along with shrubs and in my back yard I have a tree, shrubs and flowers. I've noticed that the shrubs, flowers and plants in the backyard are a more vibrant green and are flourishing where as the shrubs and flowers in the front yard are sometimes brown. I've really never noticed that before. Since they are all outdoors they receive the same amount of water when it rains. Is it the amount of light that makes a difference? Maybe the tree and the house are protecting that backyard from extreme sunlight? Although I think our front

> yard is beautiful, I'd love to find a way to keep the vibrant colors of my plants and shrubs. (CM journal 9/22/01)

Through these connections to their own yards and neighborhoods, we hoped the in-service teachers would learn to use the city, and their experiences living in the city, as resources for teaching science and social studies. The teachers generally wanted to spend at least part of each afternoon science class session going outside and looking at trees, clouds, birds, etc. I viewed this as evidence that these teachers found these activities to be personally meaningful, especially when they would report to me things they had observed on days when we did not even have class. Additional evidence of these broader community connections could be seen in the in-service teachers' nature journals as the semester progressed. By the end of the semester, several teachers expressed renewed appreciation for observing nature and felt it was important to share this with their own children.

> This journal entry will be slightly different than the rest. I would like to thank you for forcing me to appreciate the beauty that the outside world has to offer. Before this class, I was far from what you would call an outside person, but now I play with ladybugs. I no longer complain about not having money and not being able to go anywhere because of it. I now go to the park and every time I go things change and I see things that were never there before. I no longer go to the park just to let my son play. We use that time to bond by reading and talking. We also use the park to explore and learn new things together. Thank you again for making me open my eyes and appreciate my world around me. (KC journal 11/11/01)

As an initial social studies experience, the in-service teachers created and shared autobiographical poems entitled "Where I'm From." These poems included individual teachers' hobbies and interests, family customs, favorite foods, family history, hometowns and neighborhoods, linguistic expressions, ethnic, racial, and cultural heritage, religion, and hardships endured. In addition to building community among these teachers, the content of their poems provided personal connections to social studies that became the foundation for further inquiry. Following is one example of these poems:

> I am from Pontchartrain Park
> where the rule at home was to be in before dark.
> I am from a family of eight
> remembering how we used to share skates.
> I am from a mom who would braid hair for hours;
> who cooked large meals, still does and never tires.
> I am from a dad who worked hard to bring home the meat
> and stood at the door for every guy coming to greet.
> I am from a circle of six sisters
> with a bond so strong
> husbands sometimes feel they are tag-alongs.
> I am from a love of twenty-two years,

he hears the same greeting year after year,
"I'm home, did you miss me?"
I am from two sons who are taller than I;
they make fun of me because we can't see eye to eye. (SE)

The in-service teachers also collected family recipes and told their classmates the stories of where the recipes came from and when and where they had been prepared and eaten. Both the recipes and their written stories were compiled into a class cookbook that was distributed at the last class. Students also made the dishes they contributed to the cookbook and brought them to share with classmates at the final class celebration at April's house.

grade school students

After having made the point repeatedly in our teaching that it was important to try to connect teaching to students' lived experiences, their families and their communities in order to help make learning personally meaningful, it was not surprising that the pre-service teachers looked for ways to do this in their practicum teaching. They found, however, that this approach was easier to plan in theory than to carry out in practice. Our data point to a number of failed attempts to get the students t Benjamin Banneker to make these connections.

One group attempted to use literature to present the idea of cultural traditions and to get the students thinking and talking about their own cultural traditions and how these might be explored in the students' interviews with family members. However, while the story they selected, about a Jewish wedding ceremony, seemed to the pre-service teachers to make this point in a meaningful way, it did not seem to resonate with the students. It took the in-service teacher (CM) to make a connection (to Mardi Gras beads) that made the point meaningful to her students.

Our teachers have just finished reading a story and are leading a discussion.
Trish: So what is a tradition?
(No answers)
Trish: After reading the story what do you know about what a tradition is?
S: Something that people do, like have a wedding.
Trish: How about culture and heritage what do they mean?
(No answer)
Trish: Were the people in the story Jewish?
S: No.
Trish: They weren't?
S2: Yes, they were.
Trish: What were some things that they did that were different from things that your family does?
(No answers)
Trish: Was there anything about the wedding that was different from weddings you have been to?

S: They used the quilt for the wedding.
Trish: Right, that was different. Let's see if we can find anything else. What were the three things that were given to the people that were getting married?
S: Salt
S2: Flour
Trish: And gold. That was a tradition that they had.
Trish writes a definition of tradition on the board – "sentiments and beliefs about the world passed from generation to generation"
They also put up definitions of generation, culture and heritage – *I wonder if these dictionary definitions will have much meaning to the students?*
Trish: So now what is a tradition?
S reads the definition off the board. *I think she's decoding without reading for comprehension.*
Trish: So now in your own words, what does that mean?
(No response)
CM steps in at this point saying: Look, gang, it's like catching beads at Mardi Gras – do they do that anywhere else?
S: No, just here.
CM: Right, we just do that here. That's a tradition that we have. It seems totally normal to us, but when tourists come from other places, they're like, wow! Look at that.
Students are nodding their heads in comprehension. Trish now tries to connect this back to the wedding story.
Trish: So does anyone have an object in their home that is special to them like they had the wedding quilt in the story?
(No answers)
Trish seems to give up at this point and move on to the next activity without ever completing her attempt to make this connection between cultural traditions and family rituals for the students. (field notes, 10/30/01)

While the Benjamin Banneker students generally did actively engage in doing hands-on science inquiry activities, especially when these activities entailed going outside, there were several examples of activities of this kind that the pre-service teachers planned with a great deal of excitement, but that the students failed to relate to in personally meaningful ways.

As the students get outside they are divided into three groups.
Linda passes out magnifying glasses to all of the members of her group. "Thank you!" Ling said smiling. She seemed excited to work with the magnifying glasses.
Paul has taken a magnifying glass and put it up to Felicity's ear. "Oooh, dirty, dirty!"
Rodney took his magnifying glass apart and stated, "Mine bust out!"

Felicity is looking at a bug through the magnifying glass. "Look at this bug! It's big!"
Rodney has put his magnifying glass back together and is looking at an ant through it. "Oooooh! I see an ant!"
Felicity asked Linda, "Can we keep them?"
Linda: No, other groups need to use them too.
Paul is looking at his hand under the magnifying glasses. He asks, "We get to keep them?"
Linda asked the students to look at the grass stem and state their observations.
Felicity: I don't see nothing.
Ling: I don't see nothing.
Paul: I see green stuff.
Paul then aims the magnifying glass on his hand: Ouch, it burned me!
Rodney: Little black – I see a little black inside.
Paul gets up and runs to the other group: We gonna beat y'all!
Rodney (yelling across to the group where Paul now is): We doin' something boring.
The two girls in the group are looking at their hands under their magnifying glasses.
Paul is looking at the ants again. Linda brought his attention back to the stem of the grass.
Rodney is taking his magnifying glass apart again.
Ling: Oooooh, look what Rodney done!
Rodney: I wanna go. I wanna move. I wanna move now.
Linda lets the group move to the next station without having recorded any observations about the grass. At the second center there are a couple of broken cattails on the ground. Two students are fighting over a magnifying glass.
Sierra: I'm ready to go back upstairs! Are we done out here?
The entire group stands and rushes toward Carol when she comes over holding more cattails.
Students begin twirling around holding the cattails and watching the fuzzy seeds come flying off and floating in the air. The students are very distracted with the cattails. Their behavior is difficult to manage right now. When Carol asks them to sit, they do not respond. At least two remain standing when she asks, and then those who did comply stand again since the others are still standing.
Paul begins twirling again: Now this ain't boring! This is funnnnnnnn!
Magdalena refuses to sit or to touch a cattail. *I don't think she wants to get the fuzz all over her clothes.*
Before Carol ever gets the group under control and making observations Linda comes over and suggests that they should go back up to the classroom.
Sierra: Yeah! It's about time!

> Later in the day, Linda confided to me how upset she was about the activity: We were so excited about doing it and it turned out to be such a disaster! It took us hours on Sunday to get it ready, we drove out to the bayou to get the cattails and all the kids wanted to do was smack each other with them. I was really disappointed in how they behaved. (fieldnotes; 11/8/01)

As the two previous examples show, the pre-service teachers struggled to effectively translate what they found meaningful in their methods courses to their own practicum teaching. Their attempts to implement the oral history project with a small group of elementary students also met with only limited success, and the pre-service teachers' reactions to the project were mixed. The following journal excerpt reflects a positive experience:

> I read them my birth story. I was trying to give the students some idea of what I wanted from them because they were getting their birth story for the social studies project. They had a lot of questions to ask me regarding my birth story. This made me happy because I knew they were interested in our project. (KL, journal; 3/18/01)

Some pre-service teachers did ask students to interview family members for oral history projects, but others were very reluctant to hear what students might learn from their relatives about their own histories. Almost all of the pre-service teachers admitted in their journals that they did not expect all, or even most, of the students who were given outside assignments in social studies to actually complete them.

Teacher comments included, "We are very nervous about the outcome of this project because we are not sure that they are going to do it at all" (SL, journal, 3/18/00). And "The oral history lesson could have gone better. I don't know if it's something we did or not, but it seemed like too much time to do too little, especially considering the grade level and what they were interested in doing." (KC, journal, 4/16/01).

Pre-service teachers expressed pleasure and surprise, however, when the majority of the students did, in fact, complete these assignments, and they appreciated students' presentations, as the following scenario illustrates:

> The students who did their interviews seemed to enjoy sharing what they had learned from their family members. Many commented on how they learned a lot of things that they did not know before. I believe this is a wonderful project. In my own class, I would spend more time on the project and make sure their parents are involved in the process. (anonymous final evaluation; 5/10/01)

Despite some of the hesitations, nearly all pre-service teachers proclaimed that they would use the oral history project in their future classrooms, perhaps with modifications, because of the learning and community that resulted in the practicum classrooms. One

student wrote, "I believe that the oral histories helped foster the 'we care about you' attitude. Students desperately need this type of reinforcement every day" (AC, journal, 4/16/01)

One of the central tenets of our thinking about curriculum was this idea that if the content being taught could be successfully related to students personal experiences, families and communities, it would automatically be accepted by the learners and would lead to successful engagement and understanding. We believed this so strongly because we knew it to be true for ourselves as learners. While the above examples point to times when it was true for our other groups of participants as well, it became increasingly clear to us that what was personally meaningful to one group of participants was not necessarily meaningful to another. Next, we turn to the issue of instruction, and specifically, the theme of active tool use.

Instruction in support of Authentic Environmental Inquiry

Teaching science and social studies through structured inquiry meant focusing instruction on problem-posing and problem-solving. Fundamental to this approach was our belief in the need for students to engage in active use of the tools needed to conduct structured inquiry. These tools can be as simple as a ruler and a magnifying glass or more complex, such as computer-based laboratory (CBL) probes and digital video cameras with editing software.

Active tool use

teacher educators

As teacher educators, we believed that tool use was meaningful when we provided our students opportunities to use a range of tools for a variety of tasks.. The following field note excerpt provides one such example using CBLs to take measurements and collect data on change over time.

> CB asked if people in the group liked using graphing calculators and Sara shook her head. CB says that he doesn't either and that he always resisted using data collection probes until he could use them with laptop computers. CB begins to explain how to set up the CBLs.
> Ronda is writing steps down as CB talks, and all groups are engaged in plugging CBLs into the laptop computers and attaching the temperature probe.
> Anne and Amy are working closely together to get the probe plugged in.
> Mary is on her knees, leaning toward her computer. Sara stated, "I see a reading at the bottom."
> CB: So what is the air temperature?
> Sara: 21.
> CB: 21 what? What are the units?
> Sara: 21 degrees Celsius.
> CB then explains how to begin collecting data over a period of time.

CB: If we collect air temperature data for one minute, what do you think the graph will look like?
Sara: It will go like this (indicates a linear increase with her finger).
Joy: No, it will be a flat line.
CB: Why a flat line?
Joy: because the temperature isn't going to change much in a minute.
CB: Well, let's see. Click the collect button and let's find out.... So who was right?
Sara: Joy was. It's a flat line.
Joy has clamped her hand around the thermometer to watch how this changes the temperature over the course of the minute. She did this before CB told the groups to try and devise a way to make the temperature readings change.
CB: Now do it again, but this time see if you can do something to make the line on the graph change.
Some groups take the thermometer and clutch it in their hands. Joy and Laura are putting the thermometer against a cold bottle of water.
CB: So that's the air temperature. Now what about the water here in the lagoon? (fieldnotes, 9/20/01)

While the above example focuses on Cory's commitment to using tools for observing and collecting data about the natural world, the following vignette points to ways that April attempted to make tool use meaningful in the social studies class.

April: One of my overarching goals for elementary social studies methods is for students to use the tools of various social scientists--geographers, economists, historians, political scientists, anthropologists, and sociologists--to explore and share their growing knowledge about social studies from a variety of perspectives. I try to plan opportunities for these students, both pre-service and in-service teachers, to be active participants in the same kinds of experiences I hope they will plan for the elementary-age children they will teach. In class we begin this process by designing and carrying out a class initiation ritual where students learn about one another through the sharing of personally meaningful artifacts. In the following weeks, we begin each session with a class meeting to participate in community-building activities. Through assignments completed outside of class and shared in class, students use the tools of the historian to conduct and present oral history interviews and the tools of the anthropologist and sociologist to investigate a culture different from their own. During the entire semester, students reflect both publicly, through class discussions, and privately in their reflection journals, about their experiences in the various learning activities and how they think each experience will transfer to their work with elementary students. At the end of the semester, they are given the opportunity to anonymously evaluate the effectiveness of each project in which they have been active tool users.

pre-service teachers

Initially, the focus of the tool use in our classes was on learning how to use the tools themselves. Eventually, this shifted to a focus on why to use these tools – what is this tool use good for? As our pre-service teachers gained practice using the CBLs for example, they began to see how these tools could be valuable.

> Mary (to CB): So when we are testing the DO, maybe take 3-4 readings and average them?
> She was asking the question in response to CB's discussion of charting the temperature, pH & DO of the water as we move along the bayou. All of the students are looking at the charts in their packet as CB talks about interpreting the DO reading.
> Ronda read off the numbers her group had collected for the discussion.
> When CB asked if fish live here, many of the students murmured yes.
> CB: So what factors might make the fish population higher or lower?
> Connie: Plants.
> Anne: More fish.
> Becky: The motion of the water.
> Jane: The time of year.
> CB: So the fish populations change throughout the year?
> Lynne: Red tide.
> CB: Aah, red tide! There's an interesting environmental issue. What do you know about red tide?
> Lynne: It kills fish.
> CB: How? Why?
> Lynne: I don't know. I knew I shouldn't have said anything!
> CB: Well, what is red tide?
> Amy: Algae.
> CB: And why do the fish die?
> Ronda: The dead zone. No oxygen.
> CB: So what does the algae do?
> Lynne: Uses up the oxygen.
> CB: But algae are plants, aren't they? And what do you know about plants?
> Jane: They produce oxygen.
> CB: So then what's going on here? That doesn't make any sense, does it?
> (No responses) CB describes the short life cycle of algae.
> Amy: Oh, okay. Dead algae.
> CB: What do you mean?
> Amy: It's the dead algae that consumes the oxygen and creates the dead zone, right? It's because too much dies all at once.
> CB: Good. So then what do you think the DO readings here will look like when I bring my class out here during the summer?
> Many students murmur, "different" or "lower."

> Joy: So it would really be good to test the oxygen every month and see how it changes during the year.
> CB: That's exactly the kind of thing I want you to consider doing with your students. Collect data over time, keep track of it, graph it and try to make sense of it. That's what scientists do. Scientists almost never just do something once and say, ok, now that's done. That's one of the main ideas I want you to come away with after this class. Get your kids to collect data over time, and tools like the CBL are a great way to do that. (fieldnotes 10/4/01)

Just as the pre-service teachers began to look for ways to apply what they were learning about the tools used in the science course, they also began to think about how to use the tools of social studies. In their journals and course evaluations, the pre-service teachers expressed the benefits of being actively involved in the initiation ritual, class meetings, and community-building activities. Comments like the following were repeated frequently in students' course evaluations:

> I thought the in-class rituals were a great way of sharing. They did help to create a sense of community among us. I felt it was easier to talk and share with everyone because I knew something about them. It also helps you put aside fears you may have when you hear everyone else is having the same concerns or struggles. I think this would be the same for children, too. (anonymous final reflection, 5/10/01)

> The one thing I have been really pleased about in both your course and Dr. Buxton's is that you teach what you preach. You don't just lecture about how things should be done in the classroom, but you actually show it to us. Through our class interactions and assignments we are experiencing what our students will. (MS, journal, 4/9/01)

in-service teachers

Unlike many of the pre-service teachers who enjoyed using complex tools like the CBLs, the in-service teachers at Benjamin Banneker seemed to find the experiences with more basic tools to be more meaningful. Activities such as using binoculars to watch birds and building alka-seltzer-powered model rockets provided some of the most fruitful discussions about learning and teaching science. The alka-seltzer rocket activity, in particular, stood out in these teachers' minds as an activity that caused them to rethink the way they approached science, as the following excerpt from the oral final exam demonstrates,

> CM: I'm thinking about the alka-seltzer rocket building activity here. I mean I had never built a model rocket before in my life. I remember we sat there for like the first 10 minutes and didn't even know where to begin. But then we just started building something based on what we knew a rocket looked like and we tested it out and then when it didn't work too good we talked about what we could change to make it work better.

> SE: And by the end we had it going good.
> CM: Right. And we talked about how that was really an important part of understanding how science really works. Scientists don't know exactly what to do when they start but that doesn't stop them from doing something, and then building on that until they get what they want. And that's important in our teaching because our kids, when they don't know what to do, they just sit there and do nothing. We need to teach them to use the tools they are given and to use whatever they already know to start somewhere and to do something and then to build on it. (final exam interviews; 12/6/2001)

The in-service teachers also reacted positively to the community-building efforts in the social studies class. Their discussions focused on the need for learning communities among teachers as well as among students. Because they were already teaching and pursuing graduate study as a cohort group, the in-service teachers were able to view their active participation in learning communities from the perspectives of both teacher and student. One veteran teacher wrote:

> As a student and teacher I have grown because of being exposed to this course and the multiplicity of active, hands-on activities, discussions, presentations, and information shared. I can honestly say I have grown as an individual, personally and professionally. As a colleague, I intend to share as much as I can as often as I can to help improve relations with teachers as well as students. My objective is to continue to be inclusive with my peers and take time to share with the persons I am closest to professionally. My students are benefiting from my change, too, as a more nurturing teacher because they are just as excited as I am about the different activities we are sharing. (VW, final reflection, 4/10/01)

grade school students

While the Benjamin Banneker students enjoyed using the cart of laptop computers that we placed in the school as part of this project, many of these students seemed, like the in-service teachers, to be more excited about some of the simpler tools that they were given an opportunity to use during the pre-service teachers' lessons. One example of this was a bird beak activity that I frequently used in the science methods class. One group used this same activity in their practicum classroom. In groups, students are given five kitchen tools that represent different types of bird beaks (slotted spoon, nutcracker, nut picks, tweezers and tongs) and five types of food to represent bird food (gummy worms, goldfish crackers, bird seed, peanuts and a piece of fruit). The students must decide which kind of bird beak is the best match for which kind of bird food and provide a rationale for their answer. The teachers did this activity on the first day of the practicum and immediately got the students engaged in active tool use.

> S: What this is? (holding the nut picks)
> S2: I don't know. It's for poking something.
> S: Pokin' you. (makes a jabbing motion)
> S2: Stop Freddie!

S3: This spoon gotta be for the goldfish.
S2: How you know?
S3: Cause it can get the fish without getting all the water. That's why, fool! (She demonstrates this as she is talking)
S4 (to Susan): The tweezers can pick up the seeds, the nuts and the gummy worms. How we know which one to put?
Susan: You need to talk about it with your group. Which one of the tools is the best fit? If you were a bird and that was your beak, which would be the easiest thing for you to eat? Remember, birds are lazy and they don't want to work any harder than they have to.
S4: Just like Marcus.
S: Shut up!
S4: I think the tweezers are best for the seeds because nothing else is really good for the seeds and the nutcracker should go with the peanuts because they're a nut.
S: Then the poker go with the gummy worms cause it's like one of those birds that poke the worms and eat 'em. (he stabs vigorously at the cup of worms with the nutpick to demonstrate his point) (field notes 4/2/01)

In terms of social studies, the need for active involvement in experiences that build community became apparent when the elementary students were expected to collect and present oral histories to their classmates. Several pre-service teachers reported students being uncooperative toward one another while working on the project and unkind toward one another during presentations. The typical response of the pre-service teachers was to practice some of the community-building exercises in which they had engaged as students. One pre-service teacher described how she led a class meeting:

> When I felt that I had a behavior problem, I spoke to the students. Our talk was a conversation of how to improve our learning environment, not a lecture. This is a practice that we have talked about in class and have read about in the text. I truly believe that including the students in decisions by having class meetings is an effective method in creating a community in the classroom. This is important in establishing a productive environment. Because of this practicum, I was able to test how well this method really works. (PM, journal, 4/16/01)

While our focus on active tool use was one main component of our model of instruction, the use of computers as tools that promote inquiry was also integrally tied to our approach to assessment, grounded in the notion that students need more freedom to document their own learning in ways that are personally meaningful. This topic is taken up in the next section.

Assessment in support of Authentic Environmental Inquiry

Taking seriously the idea that classroom assessment needed to give students greater control of how to document what they were learning meant focusing on a serious consideration of the students' prior knowledge, the use of a wide range of assessment methods and the need for the teachers to clearly model the expectations for these assessments. Technology seemed to us to be one way to support each of these goals.

Authentic uses of educational technology

teacher educators

Typically, I have found that the most meaningful uses of computers for doing inquiry have been for the collection, and representation of data. In my teaching of educational technology, I have often emphasized using computers as a way to teach graphing, a skill that has practical value from the science literacy perspective and is heavily tested on the LEAP21 exam in both science and mathematics. The vignette presented below points to my attempts to use computers to show something about data representation.

> Students are moving through three stations that have to do with teaching measurement and graphing. In the first station, students are to use the computer program Graphing Club to make graphs of the data they collected earlier in the class period during the ball drop activity. Students enter the data in the data table, and then switch between views to see what the data look like in bar graph, line graph and pie graph format. They are then asked to discuss each of these types of graphs, the differences between them and when they would want to use each kind.
> S: The bar graph is like when you have amounts, like number of students who like hot dogs, hamburgers and pizza.
> S2: And I know a pie graph is to show percents.
> S3: We talked about this in math.
> S2: Yeah, but you can really see it here. I like how you can switch back and forth between them just by clicking.
> CB (entering the discussion): So how about a line graph? When would you want that?
> S1: For something that changes a lot.
> CB: What do you mean?
> S1: Like temperature. When we looked at temperature using the probes in City Park and it changed over time. That's a line graph.
> CB: Because all the data points are continuous.
> S1: Right. They're connected.
> The second group is using motion detectors to do the distance match and velocity match activities. Students pull up a distance vs. time or velocity vs. time graph on the computer and then have one of the group members try to mirror the graph by walking back and forth in the appropriate way. Students are laughing and having a great deal of fun with this. They are able to do the distance vs. time graph after a bit of trial and error, but the velocity vs. time graph takes a lot more group discussion to figure out how the graph translates into the proper movements. (fieldnotes; 6/14/01)

We also hope that teachers taking our courses will become aware of at least some of the technological resources that are available to help them enhance their social studies instruction. One way we do this is through an assignment of website reviews. Class members review websites related to social studies, and then each choose ten sites to review, critique and post their comments on the class Blackboard website. Students are also required to use PowerPoint and digital video in the presentation of their oral history interviews.

pre-service teachers

The use of CBL probes and the other graphing programs was largely new to our teachers. Many of our pre-service and in-service teachers, however, did have previous experience using a video camera, and some of them had used video for educational purposes, such as having their teaching recorded as part of a teaching portfolio. Personally, I was never particularly enthusiastic about using video until I began to use digital video that I could edit myself. While almost none of our students enter our classes with experience using digital video as a tool for documenting learning, many of them find this to be extremely rewarding. As can be seen in the following excerpt, students in the summer section of the course were particularly interested in using this technology, perhaps because they did not have the added pressure of preparing for a field placement.

> S: So when we press import it starts to bring in the video into the computer. D o we want to bring the whole thing in or just part of it?
> CB: Usually you just want to bring in clips that are about 10 seconds long or so. Use that as your guide. If you import too much now that just gives you more editing later. Think of the importing process as your first draft of editing. Then you'll just be cleaning up and refining the second time through.
> Students continue to work on this in pairs and small groups for the remaining 45 minutes of class. I hear frequent comments by students who really seem to be enjoying doing this.
> S: Look at how you can change the order of the clips in the movie. That's sooo cool!
> S2: My husband and I got a digital video camera for Christmas and can you believe that we haven't tried to use it yet? We've been taking video but we've never tried to put it on the computer. My husband will be so impressed that I can teach him how to do it!
> S3: Kids would love this. They'd be so into it!
> When class time is over CB practically has to force several students to stop working on their movies and put the computers away, telling them, I'll give you time to work on it tomorrow. (fieldnotes; 6/13/01)

Pre-service teachers had mixed reactions to the two technology assignments in the social studies class. Almost all of them evaluated the website reviews as their least favorite learning activity of the semester. They felt that checking on the Blackboard course website each week was too time-consuming as was navigating many of the sites.

However, they all remarked that several of the sites would be helpful to their future teaching. One student added, "For me, it was useful because it helped me to get over my computer fears. This semester, because of these classes, I was forced to become a little more computer literate" (SS, final evaluation, 5/10/01)

Conversely, most students reported that they enjoyed the slide shows they created to present their oral histories. Once again, they expressed fears about technology, but the end results helped them overcome their fears. The majority of pre-service teachers seemed to share the following feelings:

> At first I didn't like Power Point because it was too difficult for me to use until someone helped me with the program. I enjoyed creating the presentation. I felt like using Power Point to do the oral history project really made the project come alive. (MW, final evaluation, 5/10/01)

Another wrote:

> My favorite experience was the Power Point presentation on the oral history topic of our choice. I really enjoyed doing my interview but probably even more than that I enjoyed listening to everyone else's. Usually when presentations are being given, I am so bored and uninterested in what is going on, but not with these projects. (AN, final evaluation, 5/10/01)

in-service teachers

The in-service teachers at Banneker, much like our UNO pre-service teachers, were generally comfortable using computers for a narrow range of tasks (i.e. word processor, email, web browser) but most had only limited experiences with other computer applications. Of all the technology that we used in the class, the in-service teachers were most interested in learning to organize materials in digital format and then burn this material on CD's as way to document learning.

> I was surprised that as soon as I got to the library teachers started asking me about burning the CD's. I told them that I didn't realize that they were so interested in burning CD's. RB told me that her son was really into mixing music and making his own CD's and she wanted to learn to do it too.
> Personally, I considered this just a question of materials management and not one of the things I was particularly interested in having the teachers learn about since I was not sure how they would actually use this skill in their classroom teaching. The teachers were highly motivated to learn this for more personal reasons. This was a meaningful skill that they saw people they knew using in their everyday lives and they wanted to use it in that way too.
> IA: We have a CD burner on our computer at home. I should really know how to use it.
> I asked the group if they could think of ways they might use this technology in their teaching. We talked about some ideas like creating a

> digital portfolio of student work or as a way to save video if they made movies of their teaching as a professional development tool. I could tell that no one took those ideas particularly seriously. Yes, these were potential uses, but none of these teachers seemed enthusiastic about them. We began burning their unit materials and while we were doing so, several teachers asked me if the procedure would be the same for burning music CD's. (Cory's journal 12/6/01)

During social studies methods, the in-service teachers were asked to take a number of virtual museum tours and critique the websites in terms of their potential for use with elementary students. While all of the teachers said they preferred the visits we took to actual museums, they did list a number of benefits of virtual museums, including their capacity for student research, interactive exhibits which involve students in hands-on participation, and allowing students to visit places they may never see in actuality. As one teacher stated, "Now viewing on the Internet is lifelike and almost like being there!" (KC, journal, 7/01/01)

grade school students

The pre-service teacher group that developed a unit on Louisiana Fish designed an excellent activity where the students use the CBL probes to graph temperature change while monitoring fish respiration. Ice was added to a goldfish bowl and the temperature change was collected while the students counted the breathing rate of the goldfish to see how changing temperature affected fish breathing rates. The students were highly engaged in this activity but as can be seen at the end of the excerpt below, the wrap-up discussion did not connect to the activity in such a way as to really make the point that the teachers were trying to make. Students enjoyed using the technology, but it was unclear whether they gained the content knowledge that the teachers were hoping.

> L: Go back to your seats now and write down the prediction about what you think may happen when you add the ice to the water. Remember, there are no right or wrong answers. You all need to make a prediction. What will happen to the temperature of the water and what will happen to the breathing rate of the goldfish?
> Groups of a few students at a time are called over to the two computers, while the other students in the class work on the fish anatomy activity. Astrid is at one station and Lynne is at the other.
> As the students start to observe the fish, the teachers realize that it is hard to count the fish breaths because the fish keep moving and the breathing is rather subtle. At first the students try to count what they are actually observing but soon they end up counting at a regular beat without really paying attention to when the fish were breathing. This makes it hard to get accurate measures.
> Astrid (to me): This is harder than we thought it would be.
> Students are very engaged in watching the fish and looking at the computer but having difficulty counting fish breaths.

> The groups also find that it's hard to get the temperature to change the way they want it to within a one-minute time frame. At one station they are watching the temperature change over time and at the other they are not.
> After everyone has had a chance at the computer, the pre-service teachers lead a wrap-up discussion.
> Astrid: What did you observe?
> S: I think it was the temperature. The fish didn't move a lot.
> L: When it was colder?
> S2: I think the fish was shivering when we put the ice in.
> S3: When the fish got colder it took more breaths.
> L: Do we think the temperature had an effect on the fish? Everyone think about it.
> (Some students nod their heads but nobody speaks)
> L: What do you think would have happened if there was oil or some sort of pollution in the water? Would that have affected the fish?
> S: I think the water was colder and that made the fish feel colder too.
> L: Good, but the question I asked was if there had been oil or trash in the water would that have effected the fish?
> S2: Our fish, he was breathing faster and he look mad like he don't want no ice in the bowl.
> S3: Fish don't like trash and it could hurt them.
> L: Right, so we need to keep the water as clean as possible. Water quality is very important for the fish so we need to try to keep the water clean. That's something we are going to keep talking about when we come back next week. (fieldnotes; 10/25/01)

According to the journals of the pre-service teachers, the elementary students were very motivated by the technology to which they were exposed during social studies. Some pre-service teachers brought cameras to take photographs of students to put in their oral history reports. Others allowed the elementary students to use the classroom computers to type the final drafts of their oral histories. Another group used a web-based program to discover the meanings of the names of many of the children in the class. Almost every group of pre-service teachers used the video camera to tape students' oral history presentations. The following description was typical:

> We allowed some students to tape other students while they gave their oral history presentations. The students were in awe of the cameras; they just loved watching themselves on tape. When I teach, I really want to incorporate the use of digital cameras into my lessons. The students just could not get enough of this technology. (MA, journal, 4/22/01)

Although the majority of pre-service teachers seemed to share this enthusiasm for technology, the same pre-service teacher also commented that her team had hoped to use the Internet but could never achieve connectivity. Others reported a variety of problems that had to be overcome to use technology successfully, prompting one student to write,

"I realized from this experience that if I plan to use technology in my own classroom, I better make sure in advance that the equipment is available and working correctly." (SW, journal, 4/9/01)

While there was obviously an interest on the part of most participants in using technology in a variety of ways, we were left to question the degree to which these uses of technology actually supported our goal of giving students more meaningful ways of expressing and documenting their learning. Participants used the technology, but did the technology support the learning of science and social studies, or did the focus become learning about the technology rather than learning with the technology? We take up issues of this nature and other dilemmas we still face in the final section of this paper.

Conclusions & Implications

There were many contexts in which this study took place (university and elementary school classrooms, cemeteries, bayous, museums and numerous other field settings) and varied groups of participants (teacher educators at an urban southern university, pre-service teachers at the same university, in-service teachers from an urban elementary school, and classes of students from that school). In each of these settings, there were times when participants were willing and able to make connections between science and social studies content and their own lived experience, to take on active learning roles using tools to engage in structured inquiry, and to fully engage in opportunities to document and reflect upon their own learning. This provided us with examples of the practical value of the AEI model as a framework that seemed to support the kinds of teaching and learning currently advocated by the national science and social studies educational reform movements. At other times, however, participants in the full range of settings studied, resisted the opportunities to engage in the learning experiences with which they were provided. This finding challenges one of the underlying beliefs of the educational reform movement, namely, that providing students with opportunities to pursue active inquiry will result in student engagement and will lead to science and social studies literacy "for all." How might we explain these findings?

We began this research project with two dilemmas we struggled with as teacher educators, the dilemma between authentic inquiry and meaningful learning, and the dilemma between authentic learning and high-stakes assessment. While helping us clarify our personal stances in regard to these initial dilemmas, this study also left us struggling with new dilemmas that arose as our work progressed. First, is the issue of the actions of our teachers as learners versus the actions of these teachers as teachers. When our pre-service and in-service teachers were participating as students in our methods classes, they could largely be described as enthusiastic about contextually authentic curriculum. That is, these teachers enjoyed this approach to learning science and social studies from the student perspective. When these same teachers were placed in the role of teachers of others, however, many continued to enact more traditional views of curriculum, instruction and assessment. Additionally, many of the attempts these teachers (especially the pre-service teachers) did make to engage students in contextually authentic curriculum, instruction and assessment were less than completely successful, leading

some teachers to question the viability or practicality of these approaches. If teachers were uncertain about the use of our model while they still had the support of a university teacher education program, how likely would they be to continue their attempts to use these approaches when they no longer have this support? This dilemma leads us back to Heath's (1994) understanding of contextual authenticity – that students learn based on the knowledge to which they are exposed and their own unique purposes for engaging with that knowledge. If our students' purposes are not aligned with our goals as teacher educators, then it is unlikely that they will enact the model of teaching that we propose.

Second, some of our experiences with this project led us to reflect back upon Nancy Brickhouse's (2001) dilemma over helping students learn to "do science" (and social studies) versus helping students learn to "do school." Even if the teachers we were preparing were convinced of the value of engaging their students' in community-based, environmental, cultural and historical inquiries, and were successful in enacting this model, would this approach really prepare students to pass the LEAP21? While we continue to believe that the answer to this question is yes, we have little evidence to support this claim other than personal beliefs and experiences (both ours and those of some of our participants) that personally meaningful learning opportunities lead to greater comprehension and retention of knowledge. Given the high-stakes nature of the LEAP testing, however, is such a personal belief enough to justify our approaches to teacher education?

Third, each of the groups of participants in our research formed different ideas about what made science and social studies personally meaningful. There often seemed to be a disconnect between what the teachers and students in each context found meaningful. There were also differences between what groups of participants found personally meaningful and what the Western canon (as played out in state mandates) defines as authentic. Thus, we are still left with the question (raised in one of our initial dilemmas) of whether it is possible (or at least realistic) to teach science and social studies in ways that are simultaneously meaningful and authentic. If the current "bottom line" for teachers is to successfully prepare students to succeed on high-stakes accountability measures, is the use of contextually authentic teaching the best approach? This issue is especially critical as we prepare teachers to work in low-performing schools where students are at high risk of failing the high-stakes assessments.

We believe that the fundamental question we must ask ourselves as teacher educators in this context is the degree to which we have been successful in changing teachers' practices to be more closely aligned with our vision of what meaningful science and social studies teaching looks like in today's urban elementary school settings. As students in our local schools continue to fail the LEAP21 exam in great numbers, it is clear that the current teaching practices are not making the necessary impact. Educators in New Orleans are actively seeking teaching strategies that will help urban students in under-resourced schools gain the skills and knowledge needed to pass these high-stakes exams. Despite the mixed results that we report in this study, we continue to be optimistic about the utility of contextually authentic teaching and our authentic environmental inquiry model as a way to foster urban students' mastery of the state science and social studies

benchmarks (from which LEAP exam questions are derived). While we must continue to refine our approaches to implementing the AEI model in our urban teacher education program, we believe this kind of work is important as more and more teacher educators confront the challenges of high-stakes assessment within standards-based education. Approaches that strive to connect what is meaningful to students (and teachers) with what is mandated that students (and teachers) learn about science and social studies can only be of benefit as we strive to create classroom communities that promote valuable learning for all. We conclude with a final reflection from one of our pre-service teachers.

> I think the one thing that I learned through this teaching experience is to never underestimate the students. I thought that some of these kids were going to have behavior and/or learning disabilities from what I had heard about the school. I was completely off base and I felt bad for having made that assumption. (anonymous final reflection, 5/10/01)

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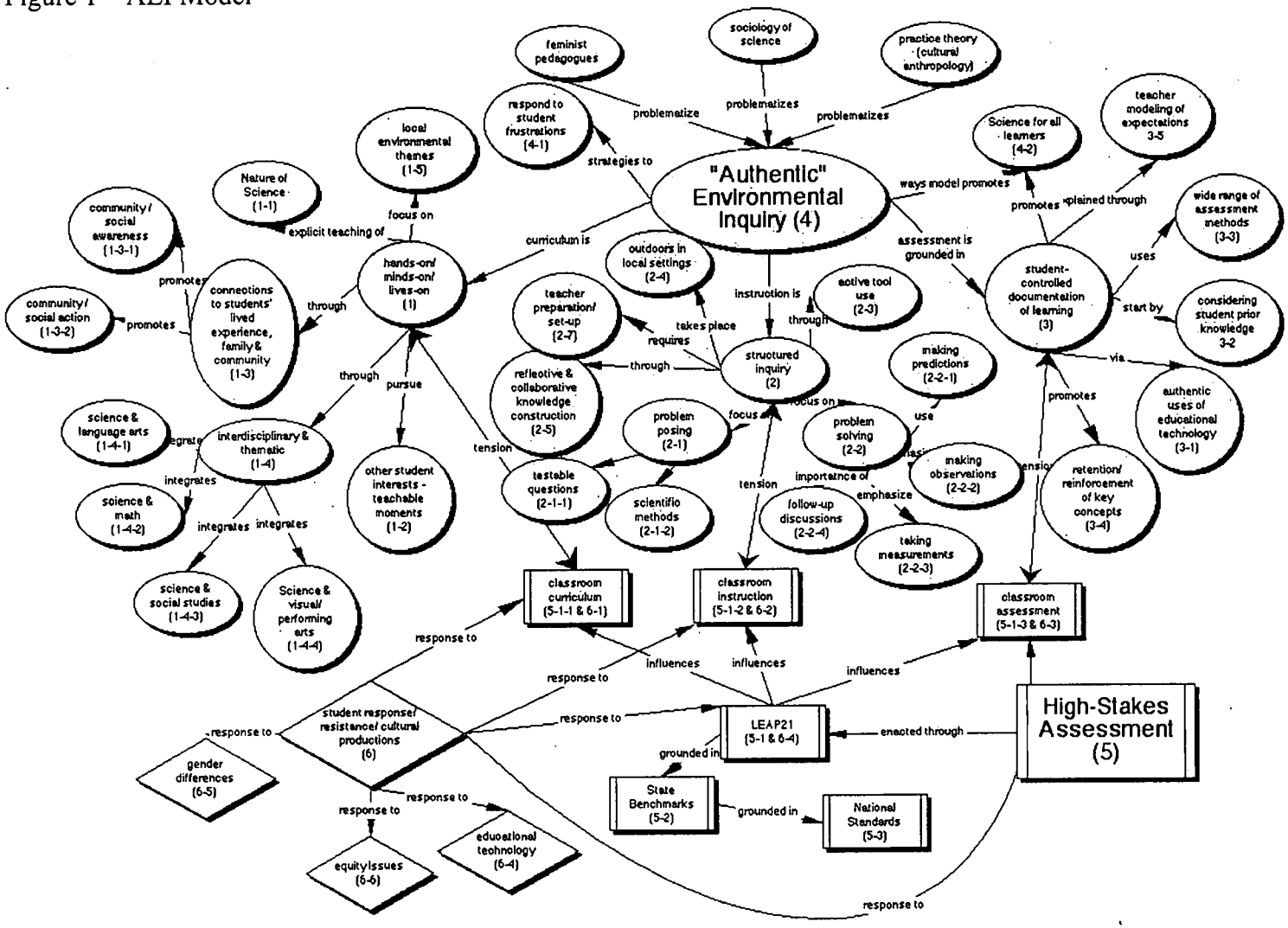
Figure 1 – AEI Model



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